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MERCURY SLUG FLOWMETER

by

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MERCURY SLUG FLOWMETER

Incidental to other researches at the Manhattan Project, the author developed with J. F. Bacon and other associates,a meter to measure small gas flows at various pressures. The requirements of an operating pressure drop of less than 3 mm. of mercury and independence from physical properties of the gas made capillary flowmeters, rotameters,and circuit-terminating flowmeters undesirable.

Various designs of absolute displacement meters were investigated. The design which was adopted was suggested by a meter described by Appleby and Avery*. In operation, the mercury slug traverses the spiral path as indicated. The spiral was made by winding six mm. pyrex tubing in a plane and allowing it to set on a slightly convex carbon block. This fixes the spiral outlet one to two mm. above the inlet.

In filling the meter with mercury, it is essential that sufficient mercury be used that a new slug close the spiral entrance before the original slug completely leaves the spiral.

The length of the slug and,therefore,the volume swept out per cycle was found to vary somewhat with flow-rate. This requires volume calibration over the range of flow-rates to be encountered. In all cases the slug length decreased gradually as the flow-rate was increased; the greatest variation encountered being a 15 per cent volume increase over the total useable range. At rates greater than about 250 cc/min, the slug breaks into several sections, causing erratic behavior; at rates less than about 25 cc/min, the volume swept out per cycle increases erratically. Timing and counting of the cycles may be done manually or by means of a relay activated the the passage of the slug past the contacts shown in the illustration.

The advantages of this meter are:

(1) It operates on a low pressure drop.

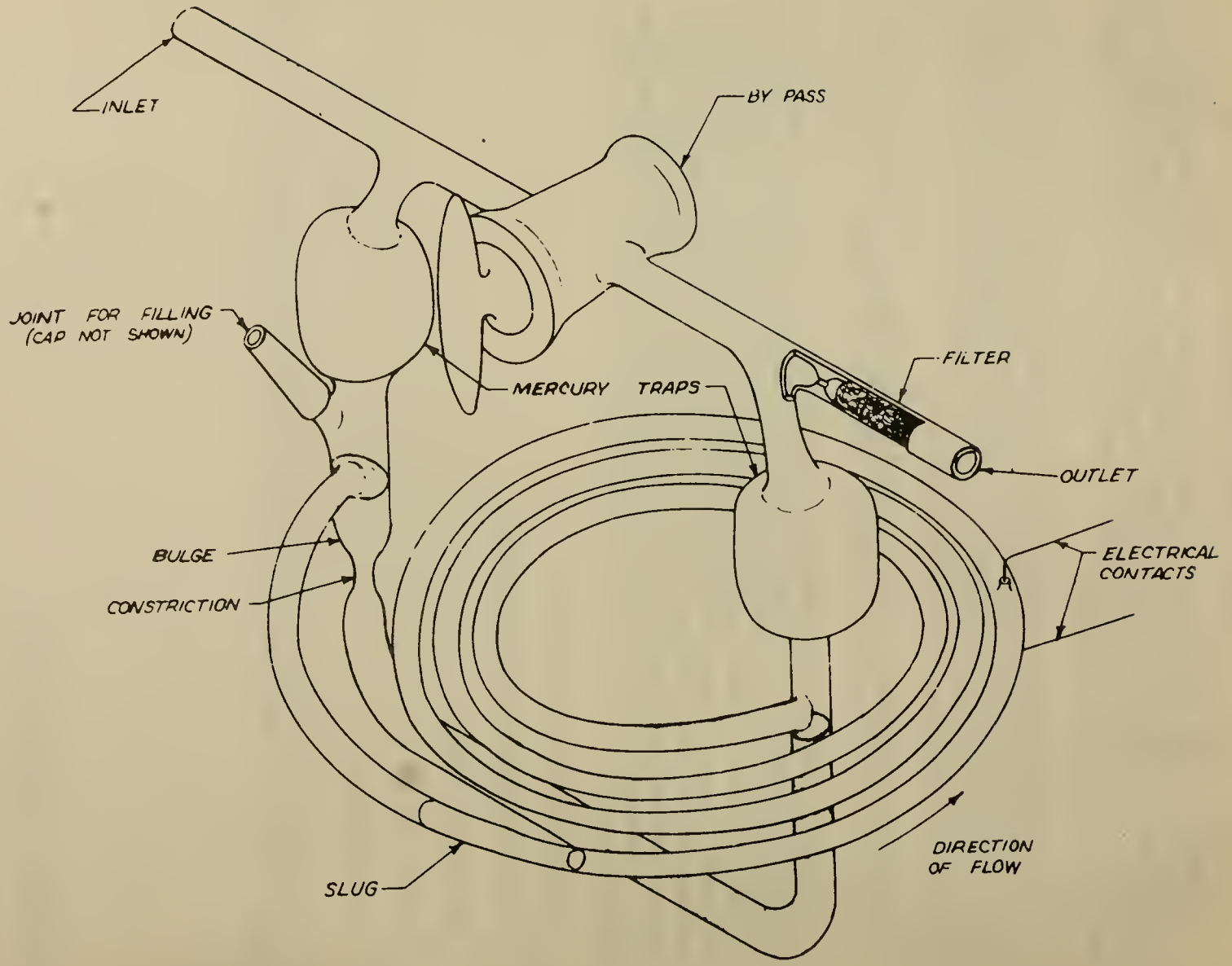
(2) It operates over a broad pressure range (2 to 76 cm).

(3) Its operation is independent of the physical properties of the gas being measured.

(4) It gives an integrated or average flow-rate, rather than an instantaneous rate.

These meters have held their calibrations to within from one to 10per cent over a period of several months of regular use. Most variations were probably due to mercury contamination.

*Appleby, W. J. and Avery, W. H.


INLET
BY PASS
JOINT FOR FILLING
(CAP NOT SHOWN)
FILTER
MERCURY TRAPS
OUTLET
BULGE
ELECTRICAL
CONTACTS
CONSTRICTION
SLUG
DIRECTION
OF FLOW

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